FIG. 1a

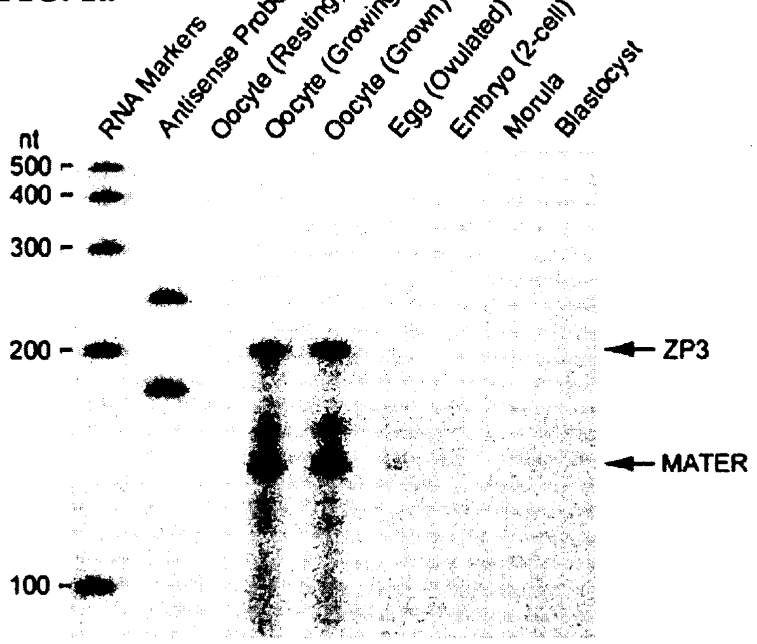


FIG. 1b

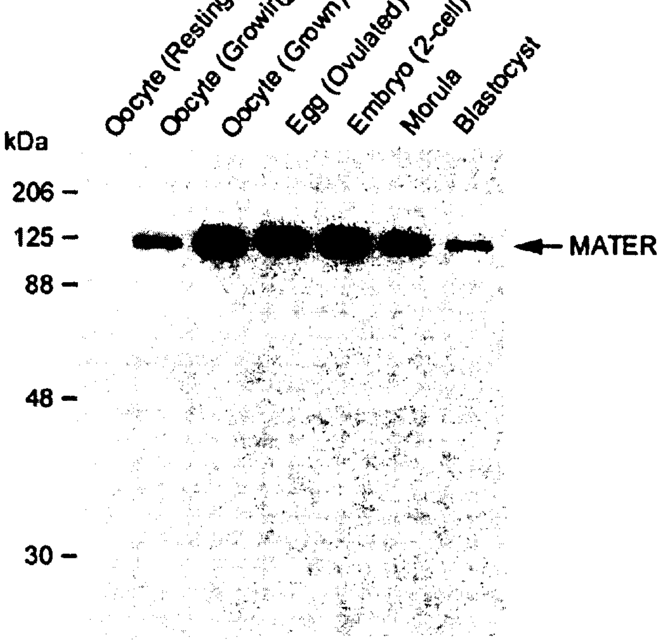


FIG. 1c

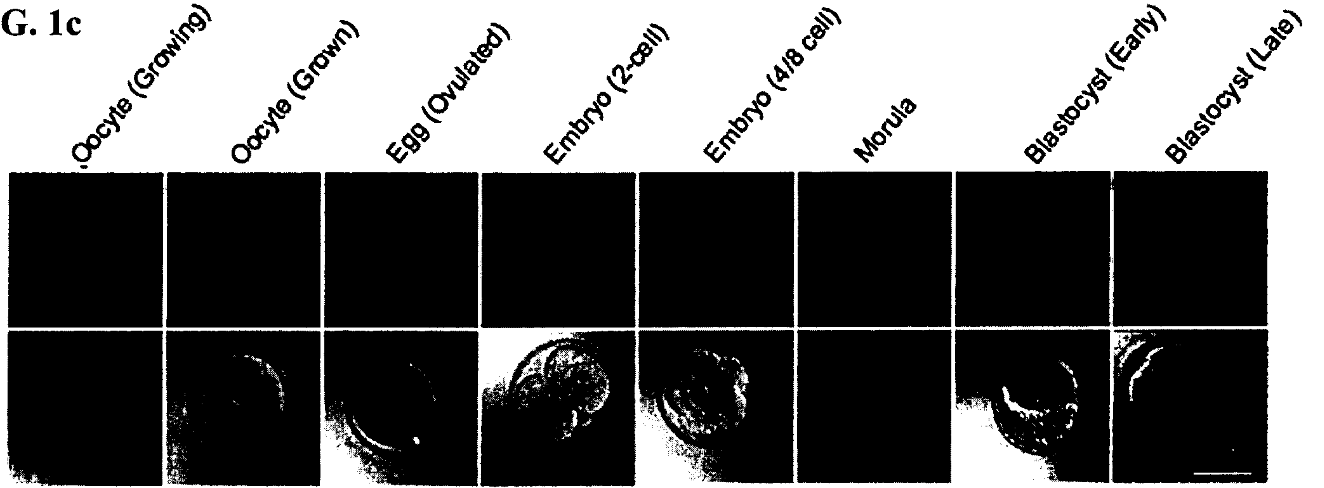


FIG. 2a

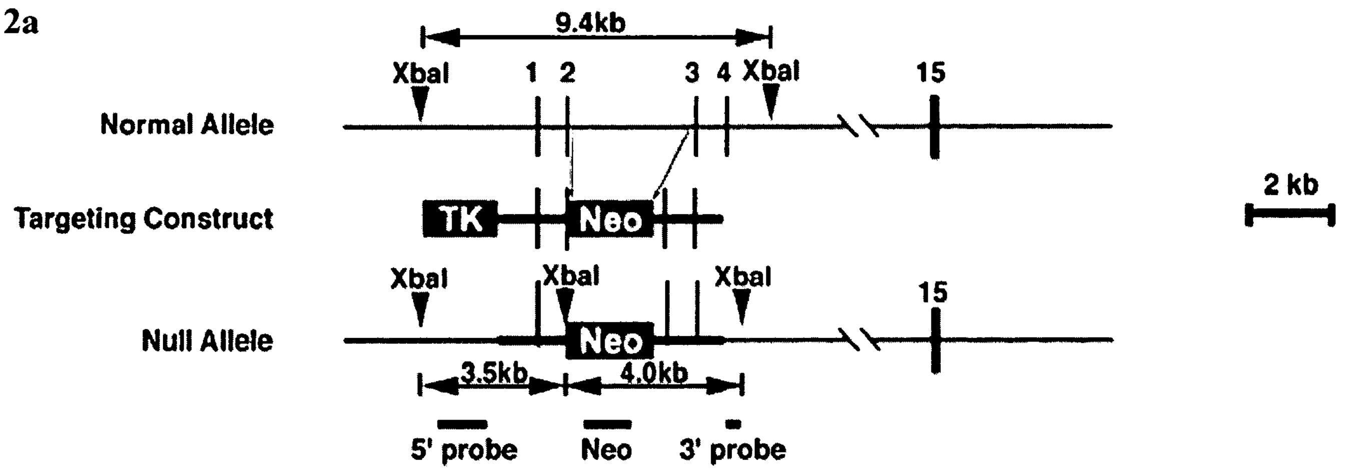


FIG. 2b

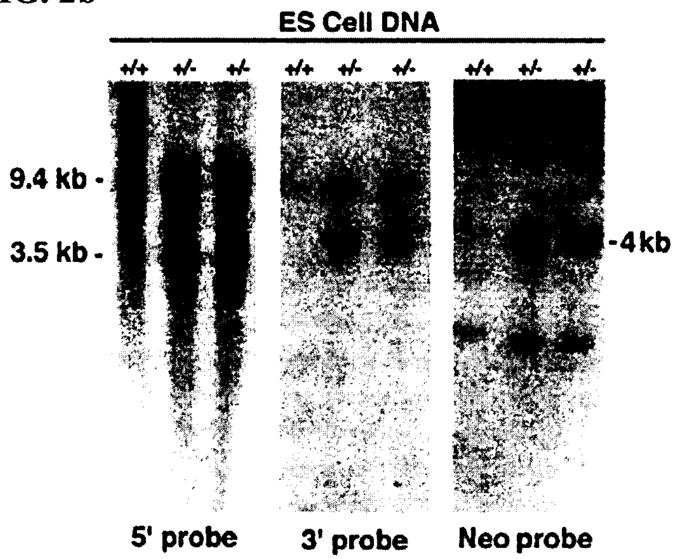


FIG. 2c

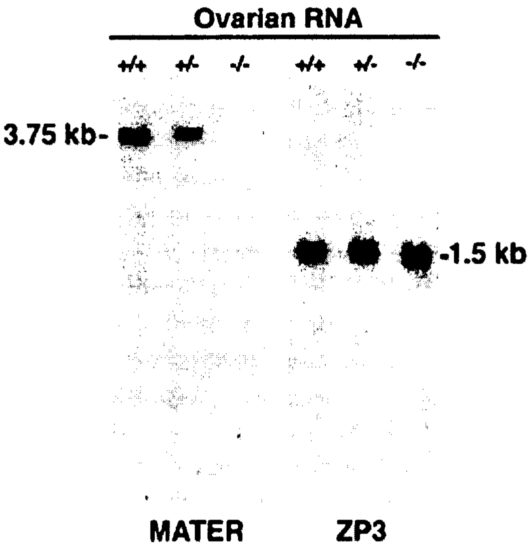


FIG. 2d

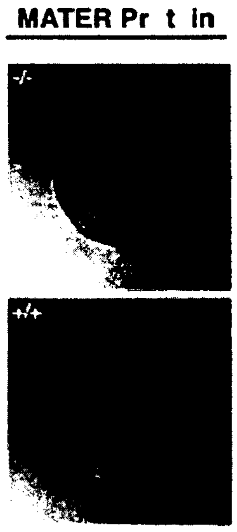


FIG. 3a - l

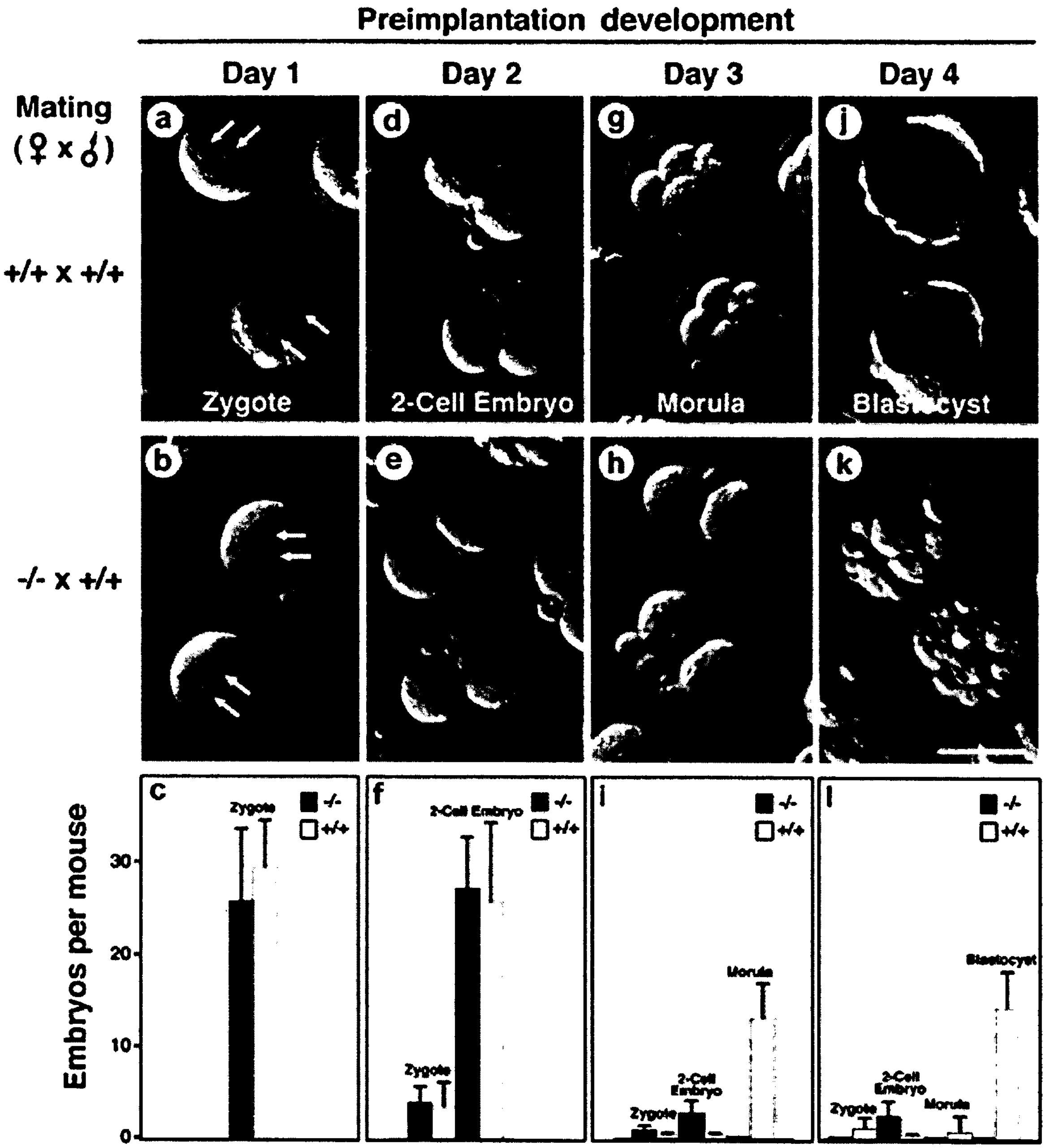

Preimplantation development
Day 1
Day 2
Day 3
Day 4
Mating
(♀ x ♂)
+/+ x +/+
-/- x +/+
a
d
g
j
Zygote
2-Cell Embryo
Morula
Blastocyst
b
e
h
k
c
f
i
l
Embryos per mouse
0
10
20
30
Zygote
■ -/-
□ +/+
2-Cell Embryo
Zygote
Morula
2-Cell Embryo
Blastocyst

FIG. 4 a - f

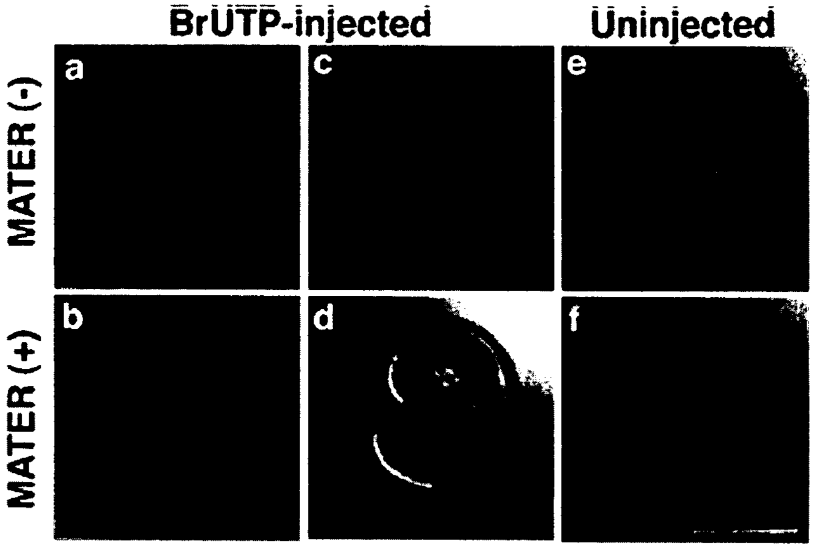
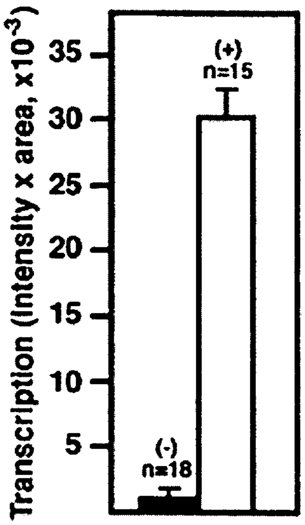


FIG. 4g



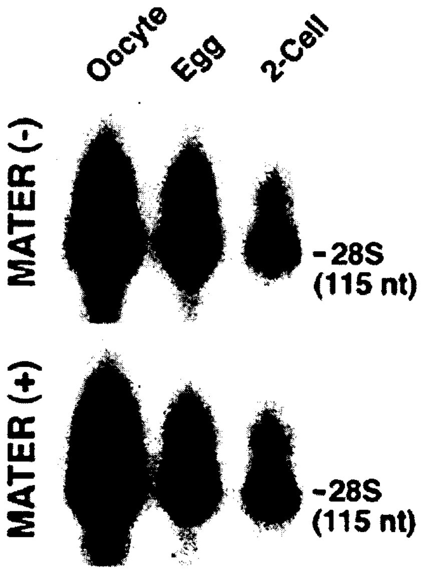


FIG. 4h

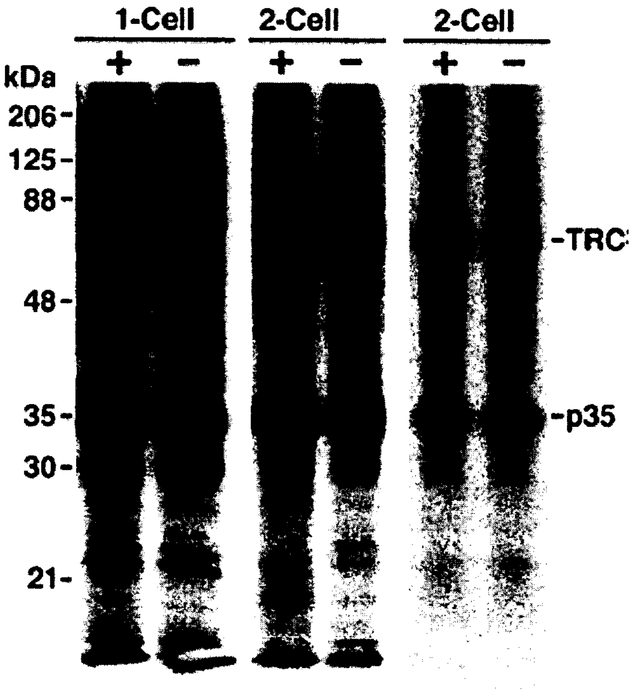


FIG. 4i

FIG. 5a

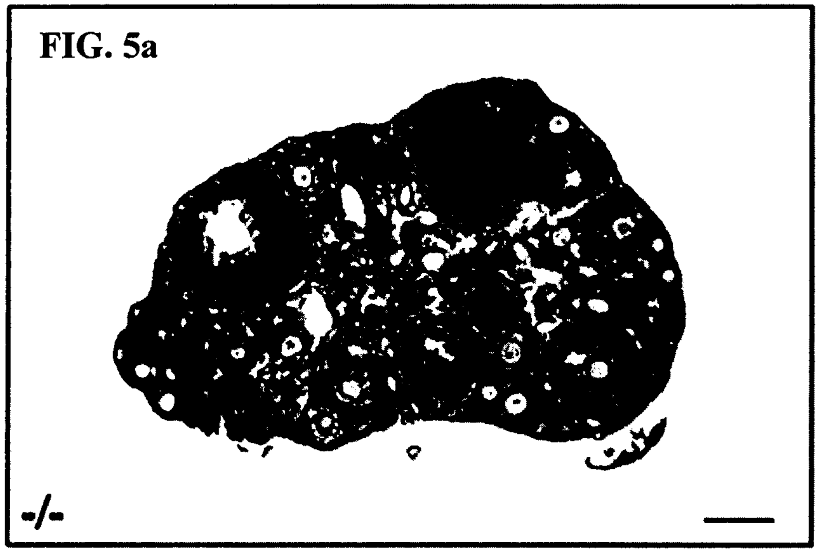


FIG. 5b

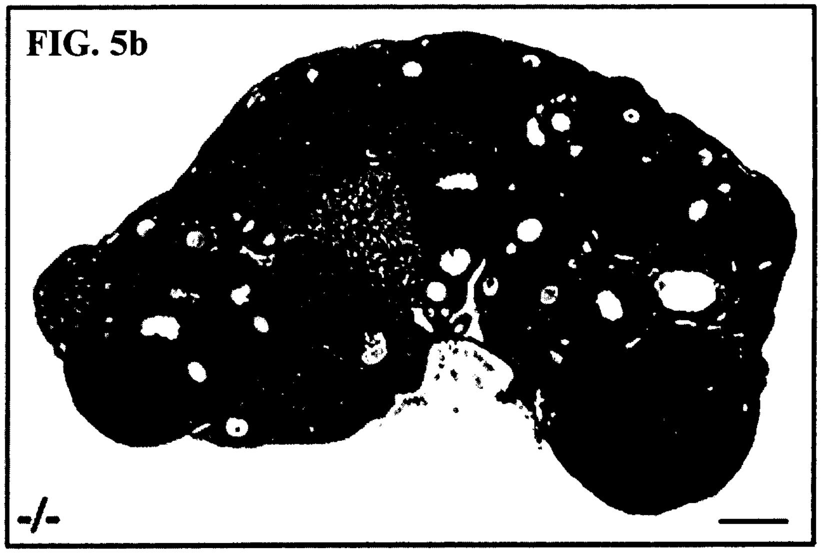


FIG. 5c

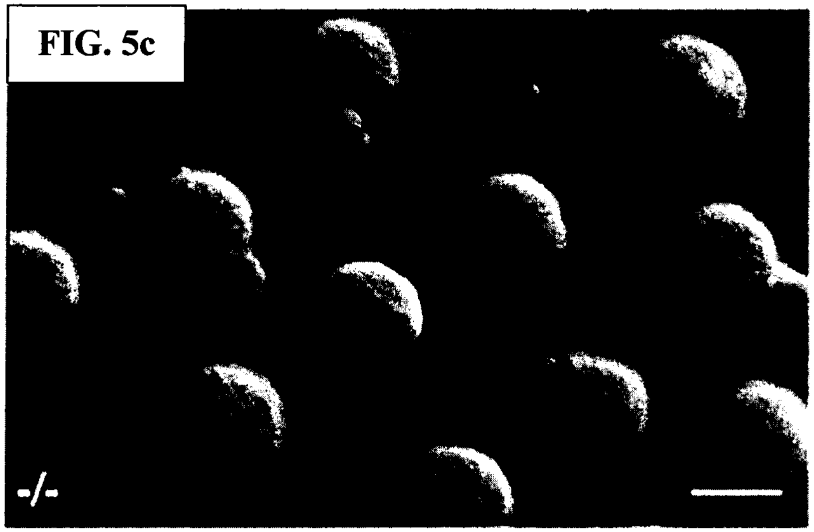


FIG. 5d

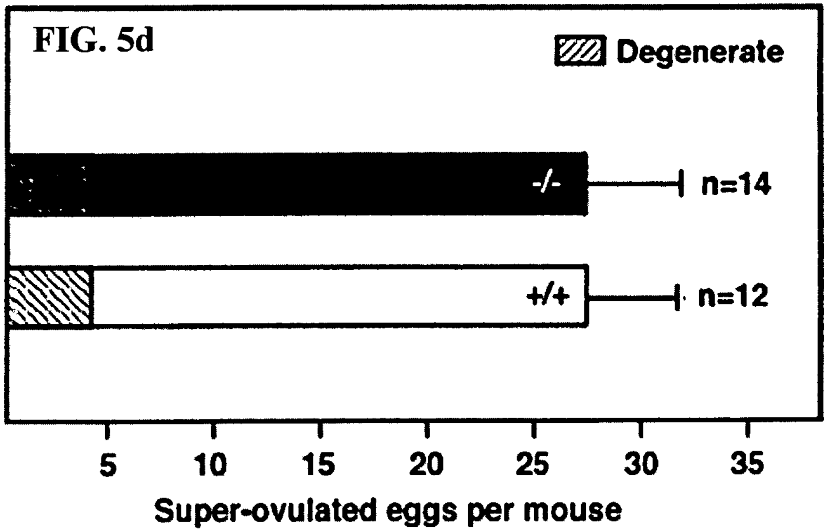


FIG. 6

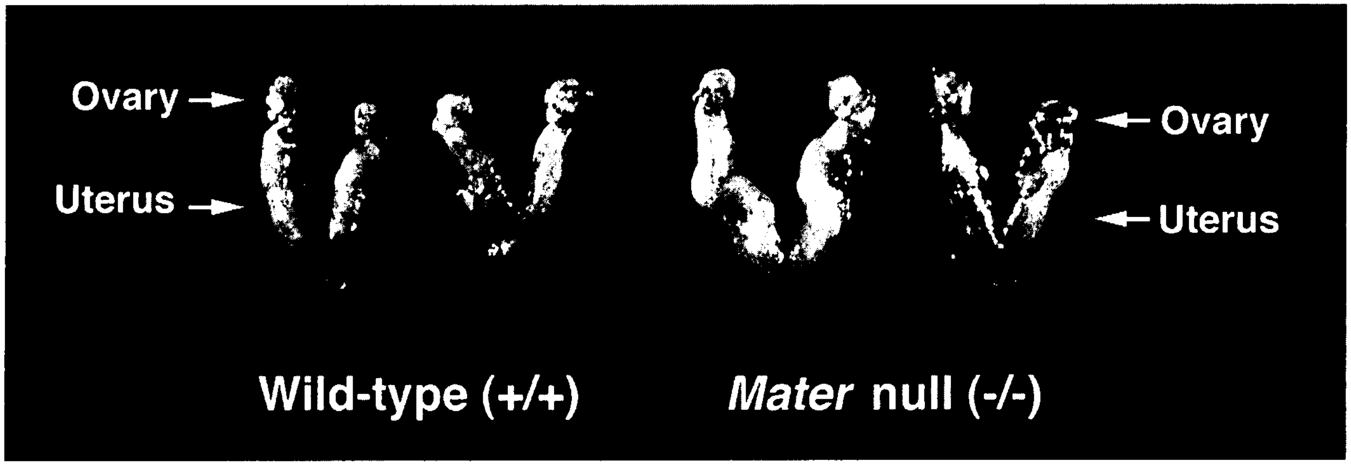


FIG 7

```
Human: 1                                                    MKVAGGLELGAA 12
       13   ALLSASPRALVTLSTGPTCSILPKNPLFPQNLSSQPCIKMEGDKSLTFSSYGLQWCLYEL 72
       73   DKEEFQTFKELLKKKSSESTTCSIPQFEIENANVECLALLLHEYYGASLAWATSISIFEN 132

Mouse: 1                                                     MGPPEKESKAI 11

Human: 133  MNLRTLSEKARDDMKRHSPE-DPEATMTDQGPSKE------------------KVPGISQ 173
            +  R L E+ + + K  SPE D ++   DQGP +E                  K  G+ +
Mouse: 12   LKARGLEEEQKSERKMTSPENDSKSIQKDQGPEQEQTSESTMGPPEKDSKAILKARGLEE 71

Human: 174  AVQQDS----------ATAAETKEQEISQAMEQEGATAAETEEQEISQAMEQEGATAAET 223
              + +S          A   ++  +E+ QA E++  T+ E + + I +    E    +ET
Mouse: 72   EQKSESTMSPSENVSRAILKDSGSEEVEQASERK-MTSPENDSKSIQKDQGPEQEQTSET 130

Human: 224  -----------EEQGHGGDTWDYKSHVMTKFAEEEDVRRSFENTAADWPEMQTLAGAFDS 272
                        ++ +GGD  DYK+HV+ KF    D+         D PEM+ L+ AF
Mouse: 131  LQSKEEDEVTEADKDNGGDLQDYKAHVIAKFDTSVDLHY-------DSPEMKLLSDAFKP 183

Human: 273  DRWGFRPRTVVLHGKSGIGKSALARRIVLCWAQGGLYQGMFSYVFFLPVREMQRKKESSV 332
             +  F+P T++LHG+ G+GKSALAR IVL WAQG L+Q M S+V F  VRE++  ++SS+
Mouse: 184  YQKTFQPHTIILHGRPGVGKSALARSIVLGWAQGKLFQKM-SFVIFFSVREIKWTEKSSL 242

Human: 333  TEFISREWPDSQAPVTEIMSRPERLLFIIDGFDDLGSVL-NNDTKLCKDWAEKQPPFTLI 391
             + I++E PDS   VT+IMS+PERLLF+IDG DD+ SVL ++D  L +DW ++QP + L+
Mouse: 243  AQLIAKECPDSWDLVTKIMSQPERLLFVIDGLDDMDSVLQHDDMTLSRDWKDEQPIYILM 302

Human: 392  RSLLRKVLLPESFLIVTVRDVGTEKLKSEVVSPRYLLVRGISGEQRIHLLLERGIGEHQK 451
             SLLRK LLP+SFLI+T R+ G EKLKS VVSP Y+LV G+S  +R  L+LE    E  +
Mouse: 303  YSLLRKALLPQSFLIITTRNTGLEKLKSMVVSPLYILVEGLSASRRSQLVLENISNESDR 362

Human: 452  TQGLRAIINNRELLDQCQVPAVGSLICVALQLQDVVGESVAPFNQTLTGLHAAFAFHQLT 511
             Q   ++I N +L DQCQ P+V SL+C ALQLQ  +G+      QTLTGL+A   FHQLT
Mouse: 363  IQVFHSLIENHQLFDQCQAPSVCSLVCEALQLQKKLGKRCTLPCQTLTGLYATLVFHQLT 422

Human: 512  PRGVVRRCLNLEERVVLKRFCRMAVEGVWNRKSVFDGDDLMVQGLGESELRALFHMNILL 571
             +   +  L+ EE++ L   C MA EGVW  +SVF  DDL    L ESE+ ALFHMNILL
Mouse: 423  LKRPSQSALSQEEQITLVGLCMMAAEGVWTMRSVFYDDDLKNYSLKESEILALFHMNILL 482

Human: 572  PDSH-CEEYYTFFHLSLQDFCAALYYVLEGLEI-EPALCPLYVEKTKRSMELKQAGFHIH 629
               H  E+ Y F HLSLQDF AALYYVLEGLE      C  ++E  +  ME+K+
Mouse: 483  QVGHNSEQCYVFSHLSLQDFFAALYYVLEGLEEWNQHFC--FIENQRSIMEVKRTD-DTR 539

Human: 630  SLWMKRFLFGLVSEDVRRPLEVLLGCPVPLGVKQKLLHWVSLLGQQPNATTPGDTLDAFH 689
             L MKRFLFGL+++D+ + LEVL   PV   V+QKL HWVSL+ QQ N T+P DTLDAF+
Mouse: 540  LLGMKRFLFGLMNKDILKTLEVLFEYPVIPTVEQKLQHWVSLIAQQVNGTSPMDTLDAFY 599

Human: 690  CLFETQDKEFVRLALNSFQEVWLPINQNLDLIASSFCLQHCPYLRKIRVDVKGIFPRDES 749
            CLFE+QD+EFV  AL  FQEVWL INQ +DL  SS+CL+HC  L+ IRVD++ +   D +
Mouse: 600  CLFESQDEEFVGGALKRFQEVWLLINQKMDLKVSSYCLKHCQNLKAIRVDIRDLLSVDNT 659

Human: 750  AEACPVVPLWMRD-KTLIEEQWEDFCSMLGTHPHLRQLDLGSSILTERAMKTLCAKLRHP 808
             E CPVV +     K L+ E W +FCS+LG+  +L++LDLG SIL++RAMK LC +LR+
Mouse: 660  LELCPVVTVQETQCKPLLMEWWGNFCSVLGSLRNLKELDLGDSILSQRAMKILCLELRNQ 719

Human: 809  TCKIQTLMFRNAQITPGVQHLWRIVMANRNLRSLNLGGTHLKEEDVRMACEALKHPKCLL 868
            +C+IQ L F++A++  G++HLW+++ +N+NL+ LNLG T +K++D+++ACEALKHPKC +
Mouse: 720  SCRIQKLTFKSAEVVSGLKHLWKLLFSNQNLKYLNLGNTPMKDDDMKLACEALKHPKCSV 779

Human: 869  ESLRLDCCGLTHACYLKISQILTTSPSLKSLSLAGNKVTDQGVTPLSDALRVSQCALQKL 928
            E+LRLD C LT   Y  IS +L ++  LK LSLA N+V  + +  L +AL  S C LQKL
Mouse: 780  ETLRLDSCELTIIGYEMISTLLISTTRLKCLSLAKNRVGVKSMISLGNALSSSMCLLQKL 839

Human: 929  ILEDCGITATGCQSLASALVSNRSLTHLCLSNNSLGNEGVNLLCRSMRLPHCSLQRLMLN 988
            IL++CG+T   C  L SAL SN++LTHLCLSNNSLG EGV  LC+ +R P C+LQRL+LN
Mouse: 840  ILDNCGLTPASCHLLVSALFSNQNLTHLCLSNNSLGTEGVQQLCQFLRNPECALQRLILN 899

Human: 989  QCHLDTAGCGSLALALMGNSWLTHLSLSMNPVEDNGVKLLCEVMREPSCHLQDLELVKCH 1048
             C++     G LA+ L  N+ LTHLSL+MNPV D  +KLLCE ++EP+C+LQ+LELV C
Mouse: 900  HCNIVDDAYGFLAMRLANNTKLTHLSLTMNPVGDGAMKLLCEALKEPTCYLQELELVDCQ 959

Human: 1049 LTAACCESLSCVISRSRHLKSLDLTDNALGDGGVAALCEGLKQKNSVLTRLGLKACGLTS 1108
            LT  CCE L+C+I+ ++HLKSLDL +NALGD GV  LCEGLKQ +S L RLGL AC LTS
Mouse: 960  LTQNCCEDLACMITTTKHLKSLDLGNNALGDKGVITLCEGLKQSSSSLRRLGLGACKLTS 1019

Human: 1109 DCCEALSLALSCNRHLTSLNLVQNNFSPKGMMKLCSAFACPTSNLQIIGLWKWQYPVQIR 1168
            +CCEALSLA+SCN HL SLNLV+N+FS  GM+KLCSAF CP SNL IIGLWK +Y  ++R
Mouse: 1020 NCCEALSLAISCNPHLNSLNLVKNDFSTSGMLKLCSAFQCPVSNLGIIGLWKQEYYARVR 1079

Human: 1169 KLLEEVQLLKPRVVIDGSWHSFDEDDRYWWKN 1200
            + LEEV+ +KP VVIDG W++ DEDDR WWKN
Mouse: 1080 RQLEEVEFVKPHVVIDGDWYASDEDDRNWWKN 1111
```

FIG. 8A

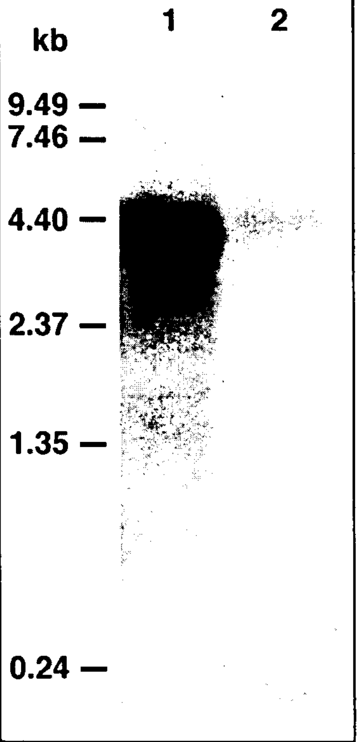


FIG. 8B

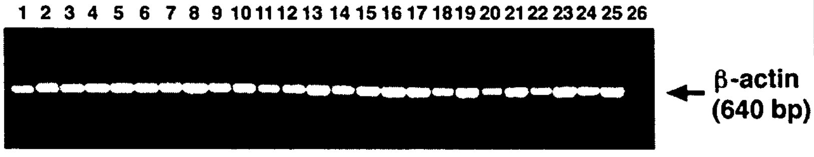


FIG. 8C

FIG. 8D

FIG. 8E

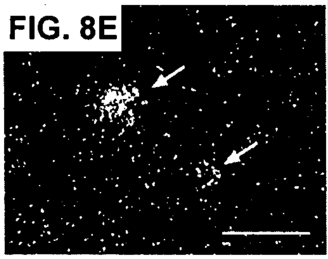


FIG. 8F

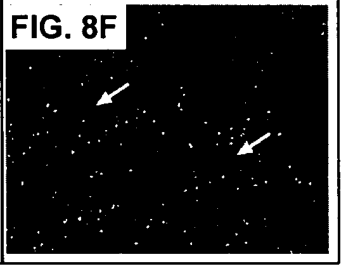


FIG. 9A

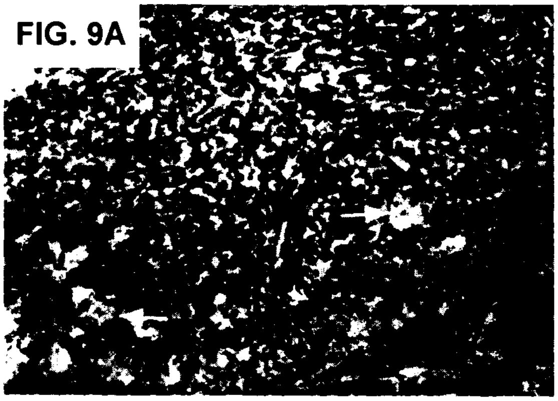


FIG. 9B

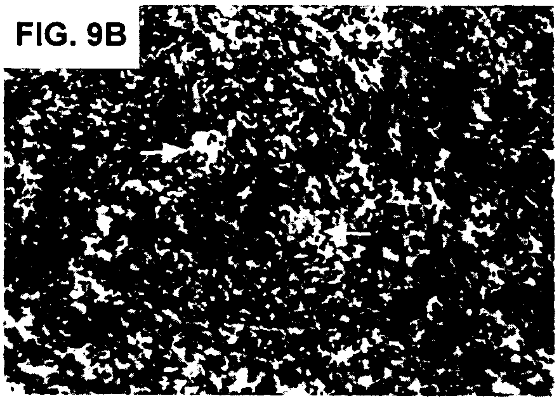


FIG. 9C

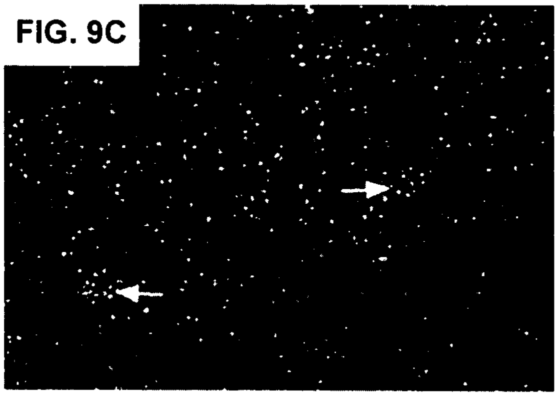


FIG. 9D

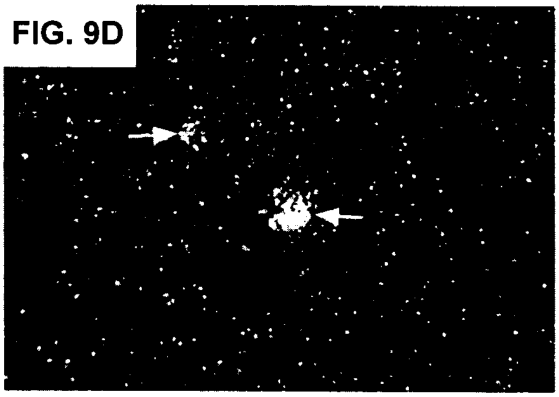


FIG. 10A

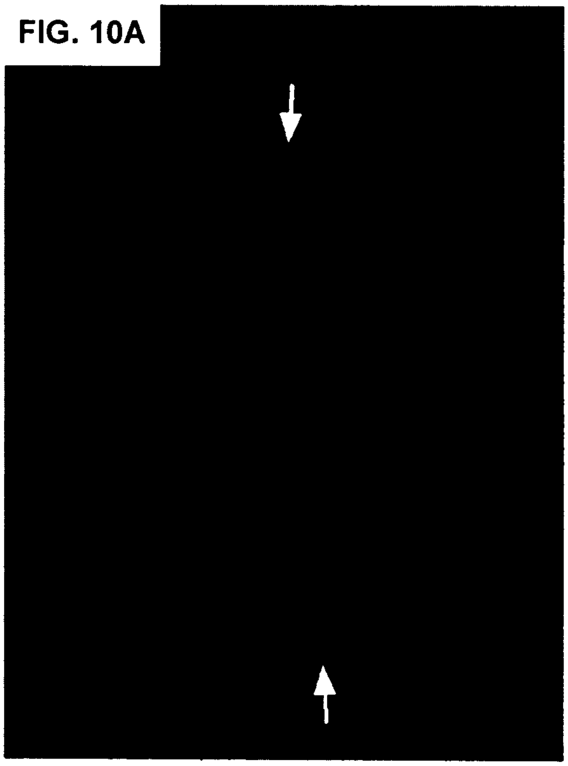


FIG. 10B

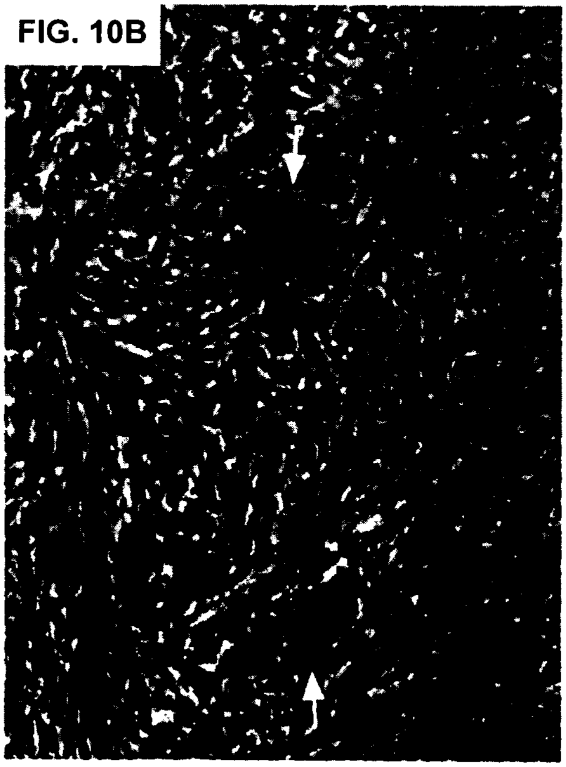


FIG. 11

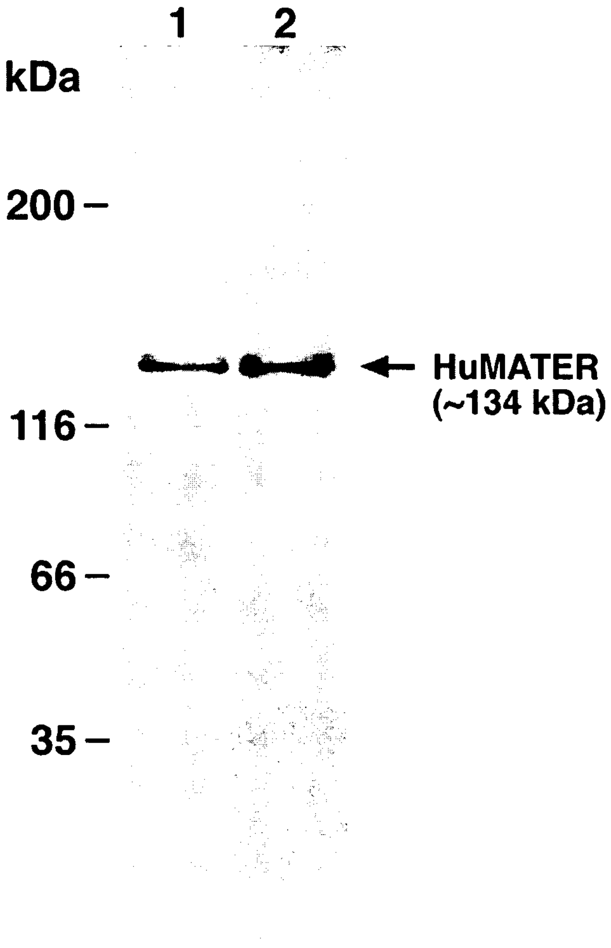


FIG. 12

```
5'-                                                                                       Number
atgaaggttgcaggaggacttgaacttggagctgctgctctgctctcagcatcaccacgtgctcttgtcactctttccacaggtcctact  90
 M  K  V  A  G  G  L  E  L  G  A  A  A  L  L  S  A  S  P  R  A  L  V  T  L  S  T  G  P  T   30
tgctctatattaccaaagaatccacttttccccaaaacctgagctctcagccttgtatcaagatggaaggagacaaatcgctcaccttt  180
 C  S  I  L  P  K  N  P  L  F  P  Q  N  L  S  S  Q  P  C  I  K  M  E  G  D  K  S  L  T  F   60
tccagctacgggctgcaatggtgtctctatgagctagacaaggaagaatttcagacattcaaggaattactaaagaagaaatcttcagaa  270
 S  S  Y  G  L  Q  W  C  L  Y  E  L  D  K  E  E  F  Q  T  F  K  E  L  L  K  K  K  S  S  E   90
tcgaccacatgctctattccacagtttgaaatcgagaatgccaacgtggaatgtctggcactcctcttgcatgagtattatggagcatcg  360
 S  T  T  C  S  I  P  Q  F  E  I  E  N  A  N  V  E  C  L  A  L  L  L  H  E  Y  Y  G  A  S   120
ctggcctgggctacgtccattagcatctttgaaaacatgaacctgcgaaccctctcggagaaggcacgggatgacatgaaaagacattca  450
 L  A  W  A  T  S  I  S  I  F  E  N  M  N  L  R  T  L  S  E  K  A  R  D  D  M  K  R  H  S   150
ccagaagatcctgaagcaacgatgactgaccaaggaccaagcaaggaaaaagtgccaggaatttcacaagctgtgcaacaagatagtgcc  540
 P  E  D  P  E  A  T  M  T  D  Q  G  P  S  K  E  K  V  P  G  I  S  Q  A  V  Q  Q  D  S  A   180
acagctgcagagacaaaagaacaggaaatttcacaagctatggaacaagaaggtgccacagcagcagagacagaagaacaagaaatttca  630
 T  A  A  E  T  K  E  Q  E  I  S  Q  A  M  E  Q  E  G  A  T  A  A  E  T  E  E  Q  E  I  S   210
caagctatggaacaagaaggtgccacagcagcagagacagaagaacaaggacatggaggtgacacatgggactacaagagtcacgtgatg  720
 Q  A  M  E  Q  E  G  A  T  A  A  E  T  E  E  Q  G  H  G  G  D  T  W  D  Y  K  S  H  V  M   240
accaaattcgctgaggaggaggatgtacgtcgtagttttgaaaacactgctgctgactggccggaaatgcaaacgttggctggtgctttt  810
 T  K  F  A  E  E  E  D  V  R  R  S  F  E  N  T  A  A  D  W  P  E  M  Q  T  L  A  G  A  F   270
gattcagaccggtggggcttccggcctcgcacggtggttctgcacggaaagtcaggaattgggaaatcggctctagccagaaggatcgtg  900
 D  S  D  R  W  G  F  R  P  R  T  V  V  L  H  G  K  S  G  I  G  K  S  A  L  A  R  R  I  V   300
ctgtgctgggcgcaaggtggactctaccagggaatgttctcctacgtcttcttcctccccgttagagagatgcagcggaagaaggagagc  990
 L  C  W  A  Q  G  G  L  Y  Q  G  M  F  S  Y  V  F  F  L  P  V  R  E  M  Q  R  K  K  E  S   330
agtgtcacagagttcatctccagggagtggccagactcccaggctccggtgacggagatcatgtcccgaccagaaaggctgttgttcatc  1080
 S  V  T  E  F  I  S  R  E  W  P  D  S  Q  A  P  V  T  E  I  M  S  R  P  E  R  L  L  F  I   360
attgacggtttcgatgacctgggctctgtcctcaacaatgacacaaagctctgcaaagactgggctgagaagcagcctccgttcaccctc  1170
 I  D  G  F  D  D  L  G  S  V  L  N  N  D  T  K  L  C  K  D  W  A  E  K  Q  P  P  F  T  L   390
atacgcagtctgctgaggaaggtcctgctccctgagtccttcctgatcgtcaccgtcagagacgtgggcacagagaagctcaagtcagag  1260
 I  R  S  L  L  R  K  V  L  L  P  E  S  F  L  I  V  T  V  R  D  V  G  T  E  K  L  K  S  E   420
gtcgtgtctccccgttacctgttagttagaggaatctccggggaacaaagaatccacttgctccttgagcgcgggattggtgagcatcag  1350
 V  V  S  P  R  Y  L  L  V  R  G  I  S  G  E  Q  R  I  H  L  L  L  E  R  G  I  G  E  H  Q   450
aagacacaagggttgcgtgcgatcatcaacaaccgtgagctgctcgaccagtgccaggtgcccgccgtgggctctctcatctgcgtggcc  1440
 K  T  Q  G  L  R  A  I  I  N  N  R  E  L  L  D  Q  C  Q  V  P  A  V  G  S  L  I  C  V  A   480
ctgcagctgcaggacgtggtgggggagagcgtcgcccccttcaaccaaacgctcacaggcctgcacgccgcttttgcgtttcatcagctc  1530
 L  Q  L  Q  D  V  V  G  E  S  V  A  P  F  N  Q  T  L  T  G  L  H  A  A  F  A  F  H  Q  L   510
acccctcgaggcgtggtccggcgctgtctcaatctggaggaaagagttgtcctgaagcgcttctgccgtatggctgtggagggagtgtgg  1620
 T  P  R  G  V  V  R  R  C  L  N  L  E  E  R  V  V  L  K  R  F  C  R  M  A  V  E  G  V  W   540
aataggaagtcagtgtttgatggtgacgacctcatggttcaaggactcggggagtctgagctccgtgctctgtttcacatgaacatcctt  1710
 N  R  K  S  V  F  D  G  D  D  L  M  V  Q  G  L  G  E  S  E  L  R  A  L  F  H  M  N  I  L   570
ctcccagacagccactgtgaggagtactacaccttcttccacctcagtctccaggacttctgtgccgccttgtactacgtgttagagggc  1800
 L  P  D  S  H  C  E  E  Y  Y  T  F  F  H  L  S  L  Q  D  F  C  A  A  L  Y  Y  V  L  E  G   600
ctggaaatcgagccagctctctgccctctgtacgttgagaagacaaagaggtccatggagcttaaacaggcaggcttccatatccactcg  1890
 L  E  I  E  P  A  L  C  P  L  Y  V  E  K  T  K  R  S  M  E  L  K  Q  A  G  F  H  I  H  S   630
ctttggatgaagcgtttcttgtttggcctcgtgagcgaagacgtaaggaggccactggaggtcctgctgggctgtcccgttcccctgggg  1980
 L  W  M  K  R  F  L  F  G  L  V  S  E  D  V  R  R  P  L  E  V  L  L  G  C  P  V  P  L  G   660
gtgaagcagaagcttctgcactgggtctctctgttgggtcagcagcctaatgccaccaccccaggagacaccctggacgccttccactgt  2070
 V  K  Q  K  L  L  H  W  V  S  L  L  G  Q  Q  P  N  A  T  T  P  G  D  T  L  D  A  F  H  C   690
cttttcgagactcaagacaaagagtttgttcgcttggcattaaacagcttccaagaagtgtggcttccgattaaccagaacctggacttg  2160
 L  F  E  T  Q  D  K  E  F  V  R  L  A  L  N  S  F  Q  E  V  W  L  P  I  N  Q  N  L  D  L   720
atagcatcttccttctgcctccagcactgtccgtatttgcggaaaattcgggtggatgtcaaagggatcttcccaagagatgagtccgct  2250
 I  A  S  S  F  C  L  Q  H  C  P  Y  L  R  K  I  R  V  D  V  K  G  I  F  P  R  D  E  S  A   750
gaggcatgtcctgtggtccctctatggatgcgggataagaccctcattgaggagcagtgggaagatttctgctccatgcttggcacccac  2340
 E  A  C  P  V  V  P  L  W  M  R  D  K  T  L  I  E  E  Q  W  E  D  F  C  S  M  L  G  T  H   780
ccacacctgcggcagctggacctgggcagcagcatcctgacagagcgggccatgaagaccctgtgtgccaagctgaggcatcccacctgc  2430
 P  H  L  R  Q  L  D  L  G  S  S  I  L  T  E  R  A  M  K  T  L  C  A  K  L  R  H  P  T  C   810
aagatacagaccctgatgtttagaaatgcacagattacccctggtgtgcaacacctctggagaatcgtcatggccaaccgtaacctaaga  2520
 K  I  Q  T  L  M  F  R  N  A  Q  I  T  P  G  V  Q  H  L  W  R  I  V  M  A  N  R  N  L  R   840
tccctcaacttgggaggcacccacctgaaggaagaggatgtaaggatggcgtgtgaagccttaaaacacccaaaatgtttgttggagtct  2610
 S  L  N  L  G  G  T  H  L  K  E  E  D  V  R  M  A  C  E  A  L  K  H  P  K  C  L  L  E  S   870
ttgaggctggattgctgtggattgacccatgcctgttacctgaagatctcccaaatccttacgacctcccccagcctgaaatctctgagc  2700
 L  R  L  D  C  C  G  L  T  H  A  C  Y  L  K  I  S  Q  I  L  T  T  S  P  S  L  K  S  L  S   900
ctggcaggaaacaaggtgacagaccagggagtaacgcctctcagtgatgccttgagggtctcccagtgcgccctgcagaagctgatactg  2790
 L  A  G  N  K  V  T  D  Q  G  V  T  P  L  S  D  A  L  R  V  S  Q  C  A  L  Q  K  L  I  L   930
gaggactgtggcatcacagccacgggttgccagagtctggcctcagccctcgtcagcaaccggagcttgacacacctgtgcctatccaac  2880
 E  D  C  G  I  T  A  T  G  C  Q  S  L  A  S  A  L  V  S  N  R  S  L  T  H  L  C  L  S  N   960
aacagcctggggaacgaaggtgtaaatctactgtgtcgatccatgaggcttccccactgtagtctgcagaggctgatgctgaatcagtgc  2970
 N  S  L  G  N  E  G  V  N  L  L  C  R  S  M  R  L  P  H  C  S  L  Q  R  L  M  L  N  Q  C   990
cacctggacacggctggctgtggttctcttgcacttgcgcttatgggtaactcatggctgacgcacctgagccttagcatgaaccctgtg  3060
 H  L  D  T  A  G  C  G  S  L  A  L  A  L  M  G  N  S  W  L  T  H  L  S  L  S  M  N  P  V   1020
gaagacaatggcgtgaagcttctgtgcgaggtcatgagagaaccatcttgtcatctccaggacctggagttggtaaagtgtcatctcacc  3150
 E  D  N  G  V  K  L  L  C  E  V  M  R  E  P  S  C  H  L  Q  D  L  E  L  V  K  C  H  L  T   1050
gccgcgtgctgtgagagtctgtcctgtgtgatctcgaggagcagacacctgaagagcctggatctcacggacaatgccctgggtgacggt  3240
 A  A  C  C  E  S  L  S  C  V  I  S  R  S  R  H  L  K  S  L  D  L  T  D  N  A  L  G  D  G   1080
ggggttgctgcgctgtgcgagggactgaagcaaaagaacagtgttctgacgagactcgggttgaaggcatgtggactgacttctgattgc  3330
 G  V  A  A  L  C  E  G  L  K  Q  K  N  S  V  L  T  R  L  G  L  K  A  C  G  L  T  S  D  C   1110
tgtgaggcactctccttggccctttcctgcaaccggcatctgaccagtctaaacctggtgcagaataacttcagtcccaaaggaatgatg  3420
 C  E  A  L  S  L  A  L  S  C  N  R  H  L  T  S  L  N  L  V  Q  N  N  F  S  P  K  G  M  M   1140
aagctgtgttcggcctttgcctgtcccacgtctaacttacagataattggctgtggaaatggcagtaccctgtgcaaataaggaagctg  3510
 K  L  C  S  A  F  A  C  P  T  S  N  L  Q  I  I  G  L  W  K  W  Q  Y  P  V  Q  I  R  K  L   1170
ctggaggaagtgcagctactcaagccccgagtcgtaattgacggtagttggcattcttttgatgaagatgaccggtactggtggaaaaac  3600
 L  E  E  V  Q  L  L  K  P  R  V  V  I  D  G  S  W  H  S  F  D  E  D  D  R  Y  W  W  K  N   1200
tgaagatacggaaacctgccccactcacacccatctgatggaggaactttaaacgctgttttctcagagcaagctatgcacctgggagtt  3690
ccttctcaaagatggagaatgatttctgattctcacaaagccctcaatggtagtgattcttctgtgttcactctacgttggttactggat  3780
ttgaaggctagagaccttcaagtcataggactcagtatctgtgaaatgtccgtcatatctcagagcatatagagggaattaaataaacac  3870
aaagcatttggaaaa-3'                                                                          3885
```

FIG. 13A

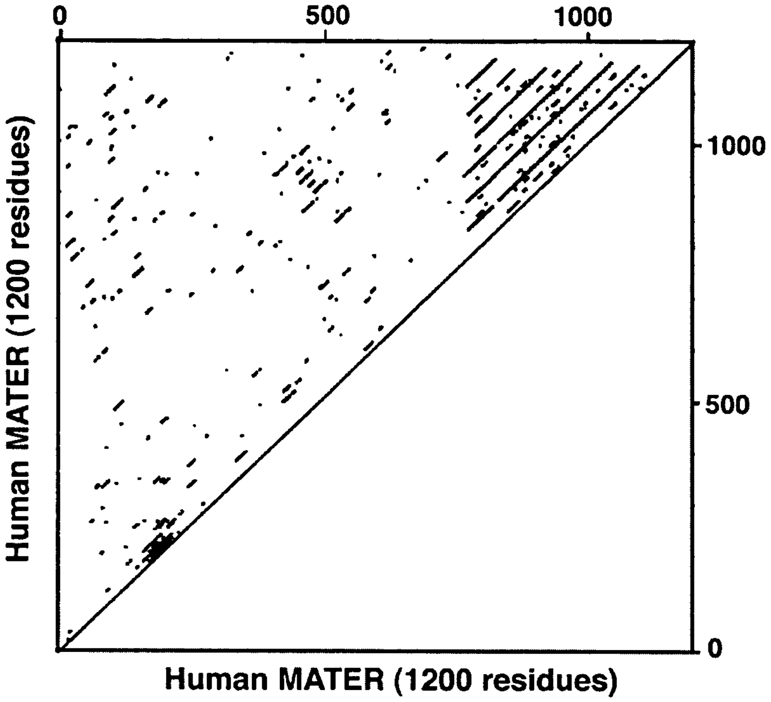


FIG. 13B

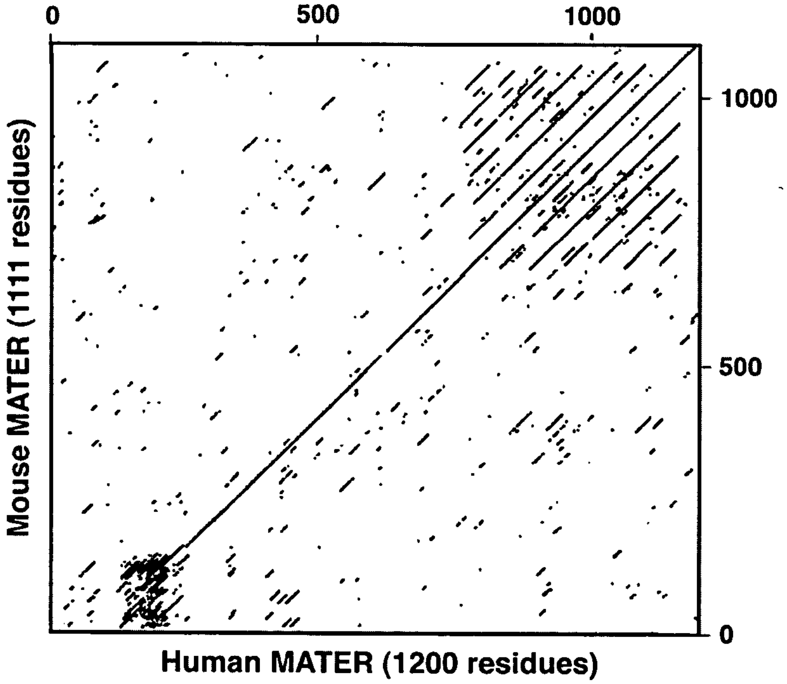


FIG. 14A

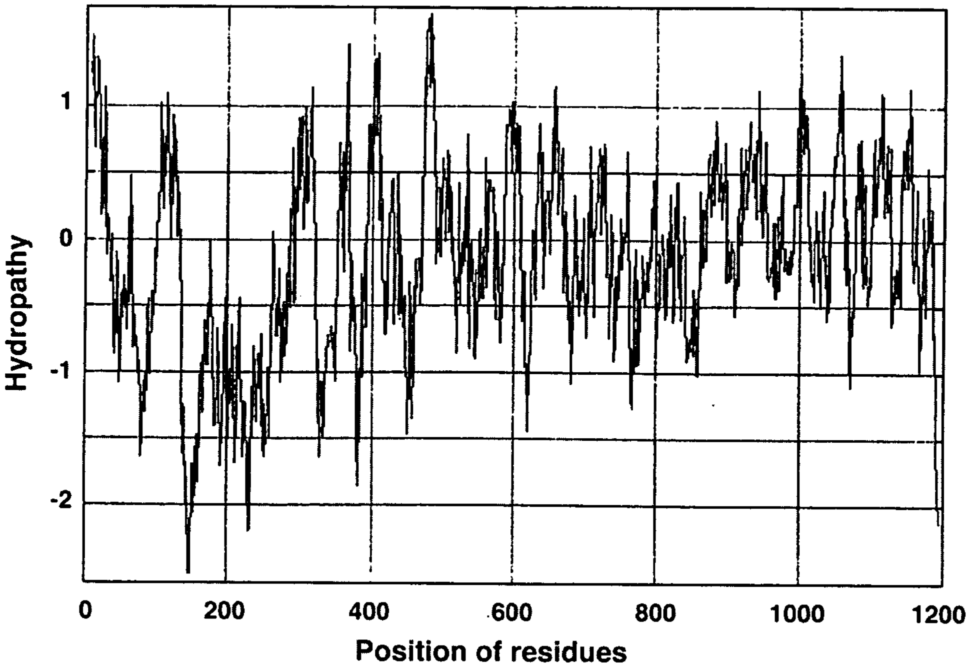


FIG. 14B

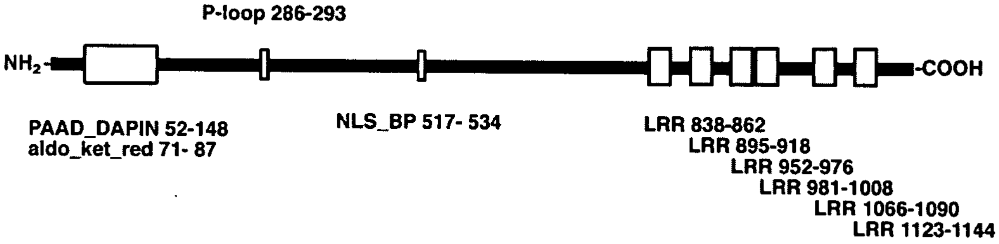


FIG. 15A

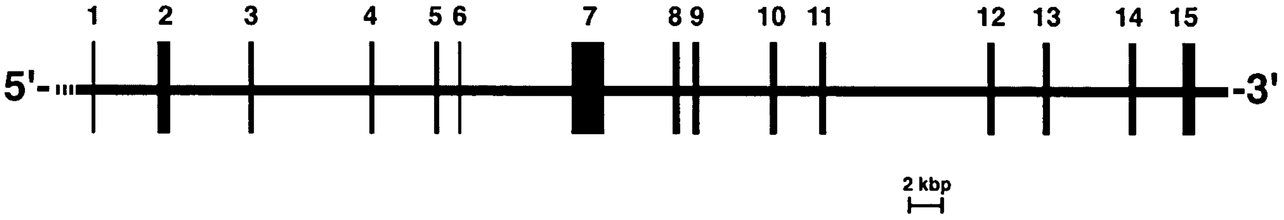


FIG. 15B